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JOINT RESEARCH VENTURES
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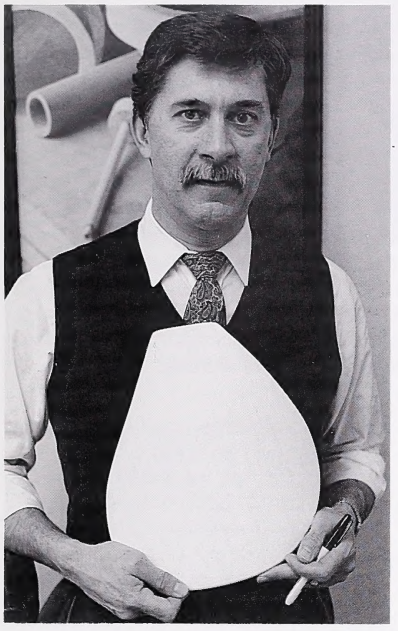
Forest management software systems

Research Council, Hughes Aircraft team up

A joint research project between the Alberta Research Council and Hughes Aircraft of Canada Limited is capitalizing on the expertise of Alberta's burgeoning information technology industry. Its objective is to develop new software systems to be used as decision-making tools for forest management and other resource applications.



Jim Kalbfleisch, president of ICS Inc., of Calgary, holds one of his company's products – a police protective vest made of bullet-proof ceramic. The superior armour is a spin-off from work done with the Alberta Research Council to develop improved ceramic coatings for pipeliners. The company has found international markets for the vests in the U.K., Australia and the United States as well as in Western Canada. (Photo by B. Steenbergen, Business in Calgary)

The work is being done under the Naia project, an earlier joint initiative of the two corporations. The Alberta Research Council and Hughes Spatial Data Systems Division are leading a group that includes forest industry participants, Forestry Canada, and the University of Calgary's Surveying Engineering department.

The Naia software would be used in conjunction with a geographic information system (GIS), a computerized system that integrates mapping and automated record keeping. Naia will add another dimension to this standard timber inventory by integrating information on forest characteristics such as soil type and slope, and using knowledge about the relationships among these characteristics to identify ecosystems within a forest.

"Our objective is to build a proof-of-concept decision-support system for the forest industry," explains Malcolm Macdonald, director of business development and marketing for Hughes Spatial Data Systems.

"Right now you can collect this information by walking through the forest. But the large size of the forest management agreements makes this approach neither practical nor economical. The Naia project technology will be a valuable aid to decision making."

Three Alberta Research Council departments are participating in the project. Advanced Computing and Engineering has an established track record in the development of decision support systems; department personnel will focus on the expert system component of Naia. The Environmental Research and Engineering department has experience in GIS (geographic information system) applications, and the Forestry department will contribute forestry and ecosystem expertise.

The one-year joint research project will develop Naia software to the proof-of-concept stage. When that phase is complete, Hughes and the Research Council expect to win industry support to develop a full-scale system.

Given the complexity of the requirements, the joint research project partners realized the need for greater participation by other corporations and agencies that can share the risks and also provide a larger pool of talent.

Forestry Canada's Dr. Ian Corns, an expert on forest ecosystems, will act as the domain expert for the Naia project. He will develop the rules that will be incorporated into

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ALBERTA RESEARCH COUNCIL

Gienow to showcase new plant, equipment

Gienow Building Products Ltd. is a winner. The Calgary-based residential window manufacturer has received the "Sub-trade of the Year Award" from the Edmonton Home Builders' Association two years in a row. The company has also won the same award in Calgary two out of the four years it has been offered.

"The awards are recognition by our peers of the consistency and quality of our products and the fact that we meet customer needs," says Gienow president Dave Munro.

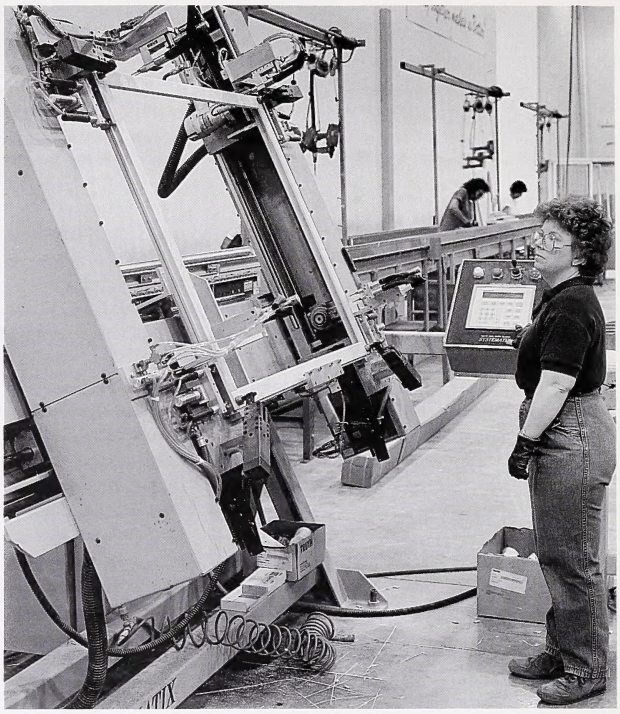
Part of the reason for Gienow's winning ways is its automated window manufacturing system, the result of a joint research venture (JRV) with the Alberta Research Council's Manufacturing Technologies department. The two-year JRV finished in late 1991. Gienow will be holding an open house in May to showcase its new plant and equipment to sponsors, staff and customers.

Gienow's manufacturing system allows the company to make only what it needs for daily production. Windows go from raw material to finished product with essentially no work in progress. This is in marked contrast to the conventional batch method of making windows which involves preparing batches of different-sized components, keeping them in inventory, then making up the windows when orders come in.

"The new system allows us to make one window for the same unit cost as 50," says Mr. Munro. "As far as I know, this type of manufacturing has never been done before in windows."

A major before/after difference in the Gienow plant is the absence of inventory. "Rehandling is the disease of our industry," Mr. Munro continues. "If builders are not ready for the windows when they arrive from the manufacturer, the windows must be stored and are more likely to be damaged in some way. If the manufacturer stores them, the windows may also be damaged and the manufacturer must pay inventory carrying costs.

"Now, as long as builders let us know of a change in plans up to three days before production is scheduled, we can reschedule to suit their timetable."



Lynn Olsen operates the computerized automatic sash pinner, which adjusts the clamps to the right size and performs work operations. In the background, are Gienow employees at sub-assembly work stations developed by the JRV team from comprehensive time and motion studies.

As well, orders are now processed and filled in three days compared to eight under the old manufacturing system. Mr. Munro expects this time to shorten even further when customers can tie into Gienow's manufacturing schedule by modem.

"The JRV was very taxing, we had to work very hard," Mr. Munro says. "But it was a good collaboration; we pushed each other and learned a lot.

"If Gienow had hired a consultant to do this for us, we would not have had the mix of skills that we did in the cooperative effort. I also believe we would have got off-the-shelf technology whereas, with the JRV, we got new ideas for windows and manufacturing."

Those new ideas have won Gienow more than awards. The dollar value of sales has doubled from four years ago – a major accomplishment given the shrinking new home market. Seventy-five new employees have been hired. Gienow has already been active in the Japanese market and plans to put more emphasis in the coming years on new markets in Canada and the U.S.

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Unique preservative dryer developed

When Gienow went from a batch system to a flow-through system for the manufacture of its windows, changes also had to be made in assembly line machinery such as the preservative drying system.

"Commercial dryers are geared to the batch system," explains Jeff Watson from the Research Council's Engineering Services group. "We had to design and build a preservative dryer that would work effectively with Gienow's new manufacturing system."

The dryer developed by the JRV team does that and more. The new machine completes the drying process in 12 minutes and takes up only one quarter of the space of commercial machines. □

Ski Tek PRO 500

Tuning clamp attracts interest in Europe, Japan

When Calgary's Rick Weissenborn returned from Germany in March, he was ecstatic. His company's unique ski tuning clamp had garnered a great deal of interest from European distributors at the world's largest international sporting goods exhibition. That success followed on the heels of a test market in Japan where the recognition and acceptance of the tuning clamp is expected to result in a ten-fold increase in orders next season.

The clamp, called the Ski Tek PRO 500, is used to hold skis in place while waxing, sharpening edges or repairing holes. Unlike conventional clamps, the Ski Tek can hold the new, injection moulded "monocoque" skis which have angled sides. The idea for the clamp was born out of frustration for Mr. Weissenborn, who is a competitive ski racer turned entrepreneur.

"Skis could slide out of the old-style clamps and be damaged," he explains. "I came into the project from an athlete's point of view – I knew there was a need for a better product."

The search for a better clamp brought Mr. Weissenborn to the Alberta Research Council. Dean Rosychuk, coordinator of the Product Development Assistance Program (PDAP), first directed Mr. Weissenborn's company – Innovation Inc. – to an IRAP-L grant for industrial design work at Calgary-based AXIS Design Associates. That was followed by assistance from PDAP for work on identifying suitable plastics for the clamp. The Southern Alberta Institute of Technology was contracted to do the work.

The next step was additional materials research at the Saskatchewan Research Council's Plastics Resource Centre. The project eventually involved A.J. Plastics of Saskatoon for production and Polymerland of Toronto for provision of the plastic material.

Mr. Rosychuk says it's not unusual for clients to be put in contact with such a wide variety of expert groups. "We network with agencies on a world-wide basis. As a result we can offer a broad spectrum of services.

"PDAP plays a key role in assisting small inventors because individuals, as well as companies, can apply for assistance under the program. The maximum project cost is

Ski Tek *continued on page four*

Company marketing gas-lift injector

When Ken Reber* and Bob Landry met in 1984, they found they shared a common interest. "We both believed there was a better, more efficient way of pumping oil than using the conventional rods and pumps," says Mr. Landry. They spent the next seven years developing a device called the Reber, Landry Gas-Lift Injector (now with a patent pending).

Their system mixes the gas produced from an oil well with the oil itself. The reservoir pressure brings the lighter gas/oil mix to the surface where the oil and gas are separated. The gas is then compressed and put back down the well to continue the process.

"Existing systems are more reliant on mechanical operations," explains Mr. Landry. "Our system takes advantage of the natural capability of the well – the gas and the reservoir pressure – to bring oil to the surface."

The gas-lift injector eliminates the need for equipment such as bottom hole pumps, sucker rod strings and pump jacks. Mr. Landry estimates that by using the injector system companies can reduce production costs by about 40 per cent, depending on well conditions.

Despite the potential savings, the inventors knew it would be difficult to market the product to the oil patch without scientific credibility. In order to demonstrate the effectiveness of the novel system, Reber, Landry Oil Tool Co. Ltd. entered into a joint research venture with the Alberta Research Council. "We came in for the science," Mr. Landry says. "We knew we had a product; we needed to show why it worked."

Under the JRV, the Research Council took a scientific approach to understanding the flow of the oil/gas mix and developed methods to exploit the technology in wells that are in a decline stage.

Dr. Petre Toma, from the Research Council's Oil Sands and Hydrocarbon Recovery department, was project leader for the JRV. "Gas-lift is not new, the first paper appeared in the 1950s," he explains. "But changes in oil production warranted a re-assessment of the whole concept of gas-lift. Instead of oil wells that are producing thousands of barrels a day, more and more wells in Canada and the U.S. are producing on the order of 50 barrels a day. As a result we're applying gas lift in a totally different situation."

This new situation presents an opportunity for the Reber, Landry Gas-Lift Injector. An estimated 30,000 wells in North America are in a decline stage. The cost of installing and maintaining conventional pumping systems on these wells often cannot be justified by the potential production gains. The gas-lift technology makes the economics for continued production of marginal wells more favourable.

Reber, Landry is now marketing the gas-lift injectors in western Canada. The company's long-term goal is for export sales to the U.S. Manufacturing of the injectors is done in Sherwood Park.

For the Research Council team, the JRV was an opportunity to do advanced research in multiphase flow. "This work puts us in a territory with many industrial applications including steam fluid flow in horizontal wells and the transportation of solids and liquids," says Dr. Toma. "There are important theoretical and practical implications from this research that go beyond gas-lifting."

**(Mr. Reber died in 1991.)*

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Thixomolding – a revolutionary technology

A joint research venture with a Calgary company is exposing the Alberta Research Council to a new technology that may revolutionize the way metal parts are made. The company is Amptech Corporation; the technology is Thixomolding – a one-step process that incorporates features of both injection molding and die casting. It eliminates the foundry handling of molten metals.

The ultimate market potential for Thixomolded parts is enormous with conservative estimates putting total sales growth at $30-million per year for the next five years.

"Thixomolding has the potential to replace conventional die casting in many applications. It is a leading edge technology that is truly revolutionary," says Dr. Dave Ghosh from the Research Council's Manufacturing Technologies department. "Our exposure to this technology through the Amptech joint research venture puts the Research Council in the big league with companies such as Dow Chemical."

Dow developed the proprietary technology and is now involved in Thixomat, a six-company consortium that holds the exclusive worldwide rights to the Thixomolding process. Calgary-based Amptech, the only Canadian participant, joined Thixomat in 1989. The company, which does both injection molding and die casting, saw Thixomolding as a strategic fit for its business.

Thixomat consortium

Amptech Corporation Comalco Aluminium Ltd.
The Dow Chemical Co.
Lindberg Corp.
George Spalding USP, Inc. □

"Despite the fact that Amptech is much smaller than the other Thixomat partners, our proposal to join was accepted," says Amptech president Ehor Babij. "They were attracted by our unique blend of expertise and our customer base in telecommunications and defense."

Mr. Babij notes that Amptech could have opted to wait for further development of Thixomolding and then become a licensee. Such a decision would have lowered both risk and cost for Amptech. But Mr. Babij was not about to take a short-term view.

"There's a shake-down going on in manufacturing in North America," he says. "Companies are dropping out like flies. If you're going to survive these days, you have to have an advantage in technology or know-how or capability. That's why we chose to get in on the ground floor of this new technology. We have a head start on our competitors and an opportunity to influence the development of Thixomolding."

The Thixomat consortium's main business is the international development and promotion of Thixomolding. Amptech's objective is the development of Thixomolded parts for its major markets in telecommunications and defense. For some applications, the switch from die casting to Thixomolding is straightforward.

"Other applications are much more complex," adds Mr. Babij. "We realized our limitations; we needed the metallographic skills available at the Alberta Research Council. The JRV program was a great fit."

The main objective of the JRV is to apply Thixomolding technology to produce magnesium alloy and metal matrix composite parts. Four products to be made by Thixomolding have already been identified. The Research Council is carrying out finite element analysis to refine product design, with testing to ensure the products meet national and international standards.

"We are doing the magnesium metallurgy for this technology," says Dr. Ghosh. "We're generating a completely new body of data. No one else has this data."

Currently, Amptech is using the Thixomolder machine at the Lindberg Advanced Development Center in Wisconsin. Travelling to the U.S. is time-consuming and Mr. Babij hopes that Amptech will be in a position to buy a Thixomolder machine in the near future. In the meantime, the focus is on developing applications under the JRV.

"The JRV is a first-class program," says Mr. Babij. "It really fills a need, I couldn't have written a better script. We had the technology – it needed development. The JRV effectively gives Amptech an R&D arm. And because the program is flexible and industry-driven, it is responsive to our needs."

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Ski Tek

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$20,000 and the program will cover up to one half of the cost." Typical PDAP projects involve new product and process development and product testing.

Mr. Weissenborn is now negotiating distribution of Ski Tek in Europe. "I had no idea that the project would be so complex when we started," he says. "But if we hadn't done all this work, the product wouldn't have the marketability and functionality that it has now. The Alberta Research Council helped us address those concerns.

"Canada is a small market. For the Ski Tek clamp to be feasible as a mass-produced consumer good, we had to focus on international markets."

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the expert system. A team from the University of Calgary's Department of Surveying Engineering, led by Dr. Ian Crain, is charged with the task of solving the technical problems when various types of information are integrated into a GIS.

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